**Sports Supplements: Motivations and Correlates of Use.**

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**Statement of Sources**

I declare that this report is my own original work and that contributions of others have been duly acknowledged.

Signed:

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## Table of Contents

## List of Figures

## List of Tables

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## Abstract

Body image issues of females have been thoroughly researched. There is now increasing research on male body image issues. Research shows males are concerned about being unmuscular and females are concerned about being thin. These concerns lead to different diet and exercise behaviour, as well as other behaviours. Males who reported using anabolic steroids to improve their appearance had higher levels of body image symptomology, is this the same for supplement users? The present study aimed to explore this by understanding the motivations and correlates of sports supplement use. 103 participants ($M$=24.5, $SD$= 5.8 years) completed an online survey asking about sports supplements use, the motivations for use and potential correlates (attitudes towards supplements and exercise, eating disorder behaviour, drive for muscularity and quality of life) of use. Male supplement users had a significantly greater drive for muscularity than female supplement users ($p$ <.001, $d$ = 1.13) and this drive was significantly correlated ($p$ <.001) with using supplements to change appearance. Increased frequency of supplement use was associated with increased drive for muscularity, compulsive attitudes towards supplements and exercise, and quality of life. These findings suggest the presence of body image issues in male supplement users, calling for further research.

## 1. Introduction

The majority of the research on body dissatisfaction and body image concerns focuses on the shape and weight dissatisfaction of females, and previously there has been little research on the prevalence of body and physique concerns of males (Neumark-Sztainer & Eisenberg, 2014). In clinical settings, the focus of body image disorders too have been centered around females (Leone, Sedory & Gray, 2005). However, there is now a growing focus on the body image concerns of males, as these concerns are becoming more prominent (Field et al., 2005). A survey conducted on over 20,000 young Australians aged 15 to 18 in 2016 found that concerns about body image were in the top three issues that were of personal concern (Bailey et al., 2016). This shows that body image issues are highly prevalent and highly concerning to Australia's youth (Bailey et al., 2016).

The concerns males report facing are different from the concerns of females. While both sexes find it undesirable to be overweight, males also find it undesirable to be too unmuscular, lean and thin (Field et al., 2005). For females, weight dissatisfaction increases as weight increases, showing more of a focus on being thin (Field et al., 2005). More specifically, females tend to be more dissatisfied with their weight and wish to have smaller legs, thighs and stomachs (Keating, Stephens, Thomas, Castle & Rossell, 2016). Males tend to place greater importance on having a big, muscular body shape and changing their upper bodies including areas such as their chests, biceps and shoulders (Keating et al., 2016). These differing concerns have been found to produce different behaviours and attitudes in males and females. Males have been found to have an elevated desire for increasing size, speed and power, whereas females have been found to be more focused on body fat and restricting calories for weight loss purposes (Muller, Gorrow, & Schneider, 2009). Research into body image issues and the resulting behaviours and attitudes is important as there may be a broader range of associated behaviours and attitudes that have not been thoroughly researched.

### 1.1 Theoretical accounts of body image

Understanding body image issues is complex because body image issues are multifaceted (Schneider, Rollitz, Voracek, & Hennig-Fast, 2016). Therefore it is important to understand the different factors that may contribute to the body image issues that males and females have. A framework that may help to explain the factors that are associated with body image issues, is the biopsychosocial model. The biopsychosocial model is a holistic model that allows for the understanding of concepts through the influence of biological, psychological and sociocultural factors (Engel, 1977). This broad scope of understanding allows for biological factors, such as age and sex, psychological factors such as self esteem and body dissatisfaction, and sociocultural factors, such as influence of the media, to be examined when looking at the body image concerns and related behaviours of individuals (Schneider et al., 2016).

A study by Schneider and colleagues (2016) used the biopsychosocial model to explain the drive for muscularity and its associated behaviours in weight training males. Some behaviours associated with the drive for muscularity are dieting and exercising, and in more extreme cases, severe body image concerns, over-exercising and misusing performance enhancing substances (Schneider et al., 2016). The study found that sociocultural factors, such as the internalisation of body ideals from the media, which has been found to be associated with body dissatisfaction (Grieve, 2007), were the strongest predictors of drive for muscularity and associated behaviours. Biological factors such as age and psychological factors such as body dissatisfaction were also found to be correlated with the drive for muscularity (Schneider et al., 2016). The biopsychosocial model allows for the understanding of the relationship between different factors and their influence on body image issues and associated behaviours.

A theory that may also help to explain how body image concerns develop and the behaviours that result from this is Objectification theory. Objectification theory explains that Western culture socialises women to perceive themselves as aesthetic objects to be looked upon, judged and evaluated, based on their physical appearance (Heath, Tod, Kannis-Dymand & Lovell, 2015). This perception comes from the constant exposure to other individuals, namely males, evaluations of them. These constant evaluations lead women to learn that their appearance matters, resulting in preoccupation with physical appearance (Heath et al., 2015). Objectification theory was developed to help explain the body image concerns of females. Researchers are now arguing that males are now being subjected to the same sorts of cultural pressures of having the "ideal" body, as men are increasingly exposed to extremely muscular male bodies (Heath et al., 2015). In fact, is has been found that men's bodies have become more prevalent and muscular in the media during the last 40 years, compared to media before the 1970's (Tod & Lavallee, 2010). There are often messages associated with these images about the positives of being more muscular and this can further contribute to the persistent objectification and evaluation of the male self (Heath et al., 2015), and in turn, lead to body image issues.

Objectification theory overlaps with social learning approaches to body image concerns. Social learning approaches explains that individuals evaluate their appearances based on messages about acceptable and unacceptable bodies on social media (Heath et al., 2015). Objectification theory calls this process self-objectification and states that self-objectification shows behaviourally via constant and persistent surveillance of the body to ensure the adherence to cultural body norms (Heath et al., 2015). The failure to meet these high expectations can lead to women feeling shame about their bodies, and has also been found to contribute to adverse consequences such as eating disorders (Calogero, Davis & Thompson, 2005) and depression (Chen & Russo, 2010). Objectification Theory has also

been used to explain more serious body image issues, like Muscle Dysmorphia (Heath et al., 2015).

Muscle Dysmorphia is a condition characterised by a distorted body image where individuals perceive their body size to be small and weak, even though their bodies are normal or even largely muscular (Foster, Shorter & Griffiths, 2015). Objectification Theory was able to explain how Muscle Dysmorphia and Muscle Dysmorphia characteristics (excessive dieting, exercise and supplement use) can stem from Western cultures' emphasis on physical appearance and evaluation of appearance by others (Heath et al., 2015). Objectification Theory provides a framework for understanding the development of body image issues, both mild and more severe, in males and females.

**1.2 Body image issues and performance enhancing substances**

As previously explained, concerns about body image can lead to different behaviours in males and females (Muller et al., 2009). Concerns about body image, especially for men, can lead to severe and damaging behaviours, like the use of performance enhancing substances, to combat the body image concerns they are facing (Schneider et al., 2016). Although the use of performance enhancing substances such as anabolic steroids has been highly documented in sports, it is becoming more commonplace in those involved in recreational exercise (Ip, Barnett, Tenerowicz, & Perry, 2011). Previous studies into anabolic steroid use has found that steroid use, as well as efforts to increase muscularity, may be the behavioural manifestation of male body image concerns (Parent & Moradi, 2011).

A study looking at Objectification theory, drive for muscularity and steroid use found that constructs of Objectification theory, such as the internalisation of cultural standards of physical attractiveness, and a heightened maladaptive drive for muscularity were correlates of males' anabolic steroid use, showing a relationship between body image issues and steroid

use (Parent & Moradi, 2011). The link between appearance based body image concerns, drive for muscularity and steroid use is important as these correlates of steroid use may be present in other populations with body image concerns.

A further study was conducted looking at the relationship between male body image psychopathology and the use of anabolic steroids in self-reported male users (Murray, Griffiths, Mond, Kean & Blashill, 2016). The results from this study found that steroid use was associated more with appearance based motivations (using anabolic steroids for appearance purposes) than performance based reasons (athletic performance purposes) (Murray et al., 2016). The results also showed that those who were using steroids for appearance based reasons had increased levels of body image psychopathology, as well as increased eating disorder psychopathology and an increased drive for size (Murray et al., 2016). This study demonstrates that anabolic steroid use is related to body image concerns and appearance based motivations for use. With the growing concerns about body image and the maladaptive behaviours associated with these concerns, the need to investigate other substances that may be used in relation to body image concerns is clear.

### 1.3 Sports Supplement Use

While it has been demonstrated that anabolic steroid use is related to body image concerns (Murray et al., 2016) and their use as a way to overcome these concerns, there are other substances, such as sports supplements, that may be being used for the same purpose. Sports supplements range from pre-workout stimulants to increase energy for workouts, to supplements that encourage muscle growth such as protein, creatine and amino acids. Sports supplements are an important research topic as the sports supplement market is a substantially growing market (Calfee & Fadale, 2006) and the use of sports supplements is becoming commonplace for athletes, both male and female, across all ages and competition levels (Muller et al., 2009).

While it is difficult to gauge public expenditure on sports supplements in Australia, figures from the U.S show huge spending on sports supplements. A study investigating household expenditure on weight loss and muscle building supplements found that Americans were spending up to $145.36 a month on weight loss supplements, and up to $141.93 a month on muscle building supplements (Austin, Yu, Liu, Dong & Tefft, 2017). This did not include money spent on any other type of supplement. This shows that sports supplements are a huge market in the U.S. Given that supplements are available in supermarkets and pharmacies, it may be the case that it is a huge market in Australia too.

Backhouse, Whitaker and Petroczi (2013) conducted a study on the relationship between supplements and the use of performance-enhancing substances (referred to as doping), as well as attitudes, norms and beliefs about doping. They surveyed competitive athletes and found that those who reported using supplements reported significantly more doping use, more positive attitudes towards doping and had significantly greater beliefs that doping is effective (Backhouse et al., 2013). These findings not only demonstrate a relationship between supplements and performance-enhancing substances, but identifies a potential group at risk for doping (Backhouse et al., 2013).

### *1.3.1 Adverse effects of supplements*

With the growth of the supplement market and the ease of access to supplements, it is essential to understand the adverse effects of supplements. Plotan, Elliot, Frizell and Connolly (2014) tested 50 sports supplements for Estrogenic endocrine disruptors. Estrogens play a crucial role in reproduction, cardiovascular health, behaviour, gastrointestinal systems, cognition and bone strength (Plotan et al., 2014). Endocrine disruptors are any sort of compound that interfere with the endocrine system and exposure to endocrine disruptors can cause adverse health effects (Plotan et al., 2014). The researchers in this study found that almost all sports supplements contained Estrogenic endocrine disruptors (Plotan et al., 2014).

This means that supplement users may be exposed to high levels of potentially dangerous endocrine disruptors, which are shown to have damaging effects on health, especially in young males (Plotan et al., 2015).

Another study looked at the adverse effects of particular performance enhancing substances, steroid precursors and sports supplements. This study found that creatine, a popular muscle enhancing sports supplement, can cause weight gain (fat rather than muscle), muscle cramps and minor gastrointestinal discomfort (Calfee & Fadale, 2006). It also found that these negative effects usually do not stop individuals from using creatine (Calfee & Fadale, 2006), possibly showing a reliance on or compulsivity towards this sports supplement.

*1.3.2 Prevalence of Supplements*

There are a number of studies that look at the prevalence and patterns of sports and dietary supplement use. Muller and colleagues (2009) assessed college athletes on their sports supplement use, as well as diet and exercise. They found that males were more concerned with size than females (Muller et al., 2009). It also found that females were more likely than males to take weight loss supplements and restrict their calorie intake (Muller et al., 2009). The results of this study reflect the differing body image concerns of males (increasing size) and females (decreasing weight) and show their differing patterns of sports supplement use but does not give an understanding of the motivations behind sport supplement usage.

A study looking at the prevalence of supplement use in frequent gym goers found high levels of participants using supplements (87.4% out of 222 participants) (Morrison, Gizis & Shorter, 2014). Morrison and colleagues (2004) surveyed gym goers about their supplement use and also compared different age groups in terms of supplement use and found that younger participants (ages 18 to 30) were more likely to consume protein shakes/bars, and that older participants (46 years and older) were more likely to consume dietary

supplements such as a multivitamin (Morrison et al., 2004). Further, younger participants reported supplement use to increase muscularity, whereas older participants reported taking dietary supplements to avoid illnesses (Morrison et al., 2004). Morrison and colleagues (2004) also assessed the relationship between exercise and supplement use in their study. It was found that those who reported exercising frequently were also taking a range of supplements more frequently (Morrison et al., 2004), showing a positive relationship between exercise and frequency of supplement use.

### *1.3.3 Motivations for Supplement Use*

In terms of research into motivations behind sports supplement use, there are studies that have assessed reasons for using sports supplements. A study looking at patterns of and reasons for supplement usage found that college students had high levels of supplement use and also reported high levels of overusing supplements (Lieberman et al., 2015). The results found that majority of participants reported using supplements for promoting general health (73% of participants), compared to increasing strength (20%) or enhancing performance (19%) (Lieberman et al., 2015). However, this study did not differentiate between dietary supplements, such as vitamins and minerals, and sports supplements, such as protein and amino acids. This may explain why participants reported supplement use primarily for health. This study shows the prevalence of supplement use in college students and does provide some insight into the reasons for supplement use, but there is still a need to distinguish between reasons for using different types of supplements.

A study conducted on young, Canadian athletes aged 11 to 25 asked participants about their frequency of sports and dietary supplement use and their reasons for using them (Wiens, Erdman, Stadnyk & Parnell, 2014). The study found that almost all participants (98%) were using at least one supplement (Wiens et al., 2014). They also found that males were consuming supplements that are associated with increasing muscle mass, such as

protein powders, amino acids and glutamine (Wiens et al., 2014), which reflects the results of previous research, in that males tend to have an increased drive for size and muscularity (Muller et al., 2009). In terms of the reasons for using sports supplements, participants in this study chose from a list of reasons with the top five being to stay healthy, to increase energy, immune system related reasons, recovery and overall athletic performance (Wiens et al., 2014). These health and performance themes around reasons for using supplements have been reflected in previous research in this area (O'Dea, 2003). Notably, appearance was not considered as a motivation for using sports supplements. Although this study included reasons for taking sports supplements, it did not ask about appearance based reasons, which with increased prevalence of body image concerns, may be an important motivation.

A similar study on the same population yielded comparable results, finding that health and performance related reasons for using sports supplements were the highest reported reasons (Parnell, Wiens & Erdman, 2015). Again, this study did not include appearance based reasons for taking supplements. The inclusion of dietary supplements with no differentiation from sports supplements in these studies may be the reason for health related reasons for use being so prominent. The addition of appearance based reasons for sports supplement use is one of importance and would help to fill this gap in research on sports supplement use.

### 1.4 The need for further research: The present study

The expenditure on sports supplements and the growing market (Austin et al., 2017; Calfee and Fadale, 2006), the resulting ease of accessibility to these substances, the existing research on females body image concerns, the growth of research into males body image concerns, and the evident gap in the literature in regard to appearance based motivations for supplement use all presents a compelling need to understand the different motivations and correlates of sports supplement usage. The evidence of body image concerns in steroid users also presents the need to understand whether these concerns are present in the ever-growing

number of supplements users. The present study hopes to discover whether findings of previous research showing body image concerns in consumers of steroids can be extended to consumers of widely available sports supplements. It also hoped that the present study will develop an understanding of the motivations behind sports supplement use.

Based on this, the present study has two key aims, which are (1), to understand the motivations (changing appearance, improving performance, improving health and improving mood) and correlates (attitudes towards supplements, eating disorder behaviour, drive for muscularity, quality of life and attitudes towards exercise) of sports supplement use; and (2) to understand the sex differences of these motivations and correlates.

Therefore, based on these aims and results of previous research, the present study hypothesised that (1) male supplement users will have a significantly higher drive for muscularity than female supplement users, and (2) that male supplement users drive for muscularity will be significantly associated with appearance based motivations for using sports supplements. To fulfil the aims of the study and to test these hypotheses, the current study will assess participants' dieting and exercise habits, their dietary and sports supplement use, their attitudes towards sports supplements, their eating disorder symptomology, their drive for muscularity, their quality of life and their attitudes towards exercise. It is hoped that by assessing these measures that it will allow for the understanding of the motivations for sports supplement use, their correlates and add to the body of literature around sports supplement use.

## 2. Method

### 2.1 Participants

There were 103 participants in the current study, with 35 males and 68 females. Participants for this study were Tasmanian residents aged between 18 and 40, with a mean

age of 24.5 years (*SD* = 5.8 years). Participants were recruited from the general community and first year Psychology students from the University of Tasmania. Participants were recruited through advertisements at the University of Tasmania Newnham campus, social media, and advertisements at gyms and sporting goods stores in the North and North-West of Tasmania. These places were targeted as rates of supplement use were likely to be higher than recruiting a random sample. For compensation of their time, participants from the general community went into the draw to win one of four $50 Coles/Myer gift vouchers. Alternatively, first year psychology students received 15 minutes of course credit as per the course requirements. This study was approved by the Tasmanian Social Sciences Human Research Ethics Committee (see appendix A).

**2.2 Materials**

The survey for the present study was created using the online survey creation website LimeSurvey. The survey included a range of demographic questions, including age, sex, location, type and frequency of exercise, dietary supplement use and type and frequency of sports supplement use. Fifteen sports supplements were listed on the survey and there was also an "other" option for any supplements being used that were not listed. Sports supplements were selected by going onto health and fitness websites and looking at the different types of supplement categories. The most frequently listed supplements across different websites were included in the survey. There were 147 items in total in the survey (see appendix B).

The survey also included a number of measures which are as follows:

*Eating Disorder Examination Questionnaire:*

A shortened version of the Eating Disorder Examination Questionnaire (EDE-Q) was included in the survey (Fairburn & Beglin, 1994). The EDE-Q was shortened to 19 items for this survey. 16 items were 7 point likert scale responses, ranging from 0 to "every day" for

questions about frequency of eating behaviours, and from "not at all" to "markedly" for feelings of bodily dissatisfaction. The remaining 3 items were number entry where participants answered questions about frequency of binge eating behaviours. The EDE-Q has been found to have acceptable internal consistency, criterion validity and good concurrent validity (Mond, Hay, Rodgers, Owen & Beumont, 2004). Higher scores on the EDE-Q indicate higher levels of eating disorder symptomology.

*Drive for Muscularity Scale*

The Drive for Muscularity Scale (DMS) (McCreary, 2000) was also included in the survey. This scale asks participants about their drive for muscularity in terms of attitudes about their body and muscle size, and behaviours individuals engage in or want to engage in to become more muscular. The DMS is measured on a 6 point likert scale, ranging from "never" to "always" with a possible score range of 0 to 90. Higher scores on the DMS indicate higher levels of drive for muscularity. The DMS has a Cronbach's alpha value of $\alpha$ = .84 (McCreary, 2000). The DMS also shows acceptable convergent validity with weight training behaviours (McCreary, 2000).

*World Health Organisation Brief Quality of Life Assessment Scale*

The survey also included the World Health Organisation Brief Quality of Life Assessment Scale (WHOQOL-BREF) (WHOQOL Group), a subjective measure of one's quality of life. Only the Psychological Functioning and Social Relationships subscales (9 items in total) were used in the current study. The WHOQOL-BREF is measured on 5 point likert scale, ranging from "not at all" to "extremely" and "completely" on the Psychological Functioning subscale, and from "very dissatisfied" and "never" to "very satisfied" and "always" on the Social Relationships subscale. The WHOQOL-BREF has a possible score range from 9 to 45. The WHOQOL-BREF has been found to have good internal consistency, with Cronbach's alpha ranging from $\alpha$ = .66 to $\alpha$ = .84 for the different subscales (WHOQOL

Group). It also has been found to have excellent discriminant validity and good test-retest reliability (WHOQOL Group). Higher scores on the WHOQOL-BREF indicate a higher quality of life.

*Commitment to Exercise Scale*

The survey also included the Commitment to Exercise Scale (CES) (Davis, Brewer, & Ratunsky, 1993). This scale asks participants about their attitudes towards exercising in regard to how they feel if they are not able to exercise. The CES is measured on an 11 point likert scale, ranging from "not important", "never upset", "never", "no routine" and "not at all" to "very important", "always upset", "always", "strict routine" and "a great deal". The CES has a possible score range of 0 to 80. The CES has been found to have a Cronbach's alpha value of $\alpha = .77$ (Davis et al., 1993). Higher scores on the CES indicate greater compulsive attitudes towards exercise.

*Compulsive Attitudes towards Supplements Scale*

Finally the survey included an adapted version of the CES for supplement use, named the Compulsive Attitudes towards Supplements Scale (CASS). Rather than ask participants about exercise, the adapted scale asks participants about their attitudes towards supplement use. Higher scores on the CASS indicate greater compulsive attitudes towards sports supplements. The CASS is measured on an 11 point likert scale, with the same answer and score ranges as the CES. As this measure was created for the present study, reliability of this scale was analysed. The CASS had a Cronbach's Alpha value of $\alpha = .887$. This value would not have been improved if any of the items were deleted. All 8 items on the CASS were correlated with one another, with correlation coefficients ranging from .310 to .772.

**2.3 Procedure**

A pilot survey was developed and distributed to pilot participants in paper form. There were 20 participants in the pilot study, 10 males and 10 females. Participants for the

pilot survey were a convenience sample from the general community. The pilot survey included the measures listed above as well as an additional four measures: the Muscle Dysmorphia Disorder Inventory (Hildebrandt, Langenbucher, & Schlundt, 2004), the Reasons for Exercise Inventory (Silberstein, Striegel-Moore, Timko, & Rodin, 1988), the Body Shape Dissatisfaction Scale (Pingitore, Spring , & Garfield, 1997) and the Kessler Psychological Distress Scale (Kessler et al., 2002). The pilot study was conducted to ensure demographic questions were understandable, and to assess the time taken to complete the survey. Upon feedback about length from pilot participants, the Muscle Dysmorphia Disorder Inventory, the Reasons for Exercise Inventory, the Body Shape Dissatisfaction Scale and the Kessler Psychological Distress Scale were removed from the survey to reduce the length and the amount of time taken to complete the survey. The WHOQOL-BREF was added to measure psychological functioning. The decision to remove these questionnaires was made by the researchers as the other measures in the survey mostly assessed the information that the removed measures were examining. Pilot participants then went into the draw to win a $20 Coles/Myer gift voucher as compensation for their time.

Participants in the current study completed the online survey after reading the participant information sheet (see appendix C) which stated that consent was implied by the completion of the survey. The survey took approximately 10-15 minutes to complete. Participants first answered the demographic questions, questions about exercise, frequency and type of dietary supplements used, frequency and type of sports supplements use, their motivations for using sports supplements and their experiences of using sports supplements. Participants then answered the CASS, EDE-Q, DMS, WHOQOL-BREF and the CES. Upon completion of the survey, participants from the community were directed to enter the draw to win one of four $50 Coles/Myer gift vouchers. First year psychology students at the University of Tasmania received 15 minutes of course credit.

# 3. Results

## 3.1 Statistical Analyses

The present study employed univariate analysis of variances (ANOVA's) and independent samples *t*-tests to analyse the differences between male and female sports supplement users on their scores the CASS, EDE-Q, DMS, WHOQOL-BREF and the CES. Chi-square contingency tables were used to analyse differences between males and females on sports supplement use, gym membership and different types of exercise. One-way ANOVA's were used to assess the differences between non-users, low frequency users and high frequency users on the CASS, EDE-Q, DMS, WHOQOL-BREF and the CES. Tukey's post-hoc tests were used to assess differences between groups and Games-Howell post-hoc tests were used when the assumption of equal variances was violated. Correlations were conducted to analyse the relationships between the different reasons for using sports supplements and drive for muscularity in males and females. Correlations were also used to analyse the relationship between frequency of supplement use and the CASS, EDE-Q, DMS, WHOQOL-BREF , CES and the motivations for using supplements. Frequency analysis was used to assess the frequency of each sports supplement used. Effects sizes were interpreted in the context of Cohen's *d*, whereby .20 indicates a small effect, .50 indicates a moderate effect and .80 indicates a large effect (Cohen, 1988).

## 3.2 Data Screening

Data were screened to check assumptions of normality and absence of outliers and to exclude participants who did not meet the criteria for the study (e.g. participants over the age of 40 years old) and participants who did not fully complete the survey. Before participants were excluded, there were 124 participants at the time of data collection cut off. After excluding those who did not meet the study criteria or did not complete the survey there were 103 participants.

### 3.3 Supplement and exercise demographics

A Chi-Square test revealed there was no significant difference in the proportions of males and females using sports supplements, $\chi^2$ (1) = .155, $p$ = .694, with 65.7% of males reporting sports supplement use, and 61.8% of females.

There was no significant difference in the proportions of supplement users and non-supplement users of sports supplements that are members of a gym, $\chi^2$ (1) = 3.517, $p$ = .061, with 68.4% of supplement users reporting being a member of a gym, compared with 48.1% of non-users.

In terms of different types of exercise, there were only significant differences in proportions of supplement users and non-supplement users in power lifting, $\chi^2$ (1) = 7.542, $p$ = .006, with 77.1% of supplement users doing power lifting, compared with 22.9% of non-supplement users. There was also a significant difference in proportions of supplement users and non- supplement users in team sports, $\chi^2$ (1) = 7.940, $p$ = .005, with 100% of supplement users playing a team sport, compared to 0% of non- supplement users.

### 3.4 Frequency analysis

See Table 1 for frequency of sports supplement use for males and females.

Table 1

*Frequency of supplement use for males (M) (n =23) and females (F) (n = 42).*

| | Never | | Once a week or less | | 2-3 times a week | | 3-4 times a week | | 5-6 times a week | | Daily (7 times a week) | | More than 7 times a week | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M% | F% | M% | F% | M% | F% | M% | F% | M% | F% | M% | F% | M% | F% |
| Protein Powders/Shakes | - | 9.5 | 8.7 | 14.3 | 4.3 | 23.8 | 21.7 | 11.9 | 21.7 | 19 | 26.1 | 16.7 | 17.4 | 4.8 |
| Protein Bars | 43.5 | 52.4 | 34.8 | 26.2 | - | 9.5 | 17.4 | 4.8 | - | 4.8 | 4.3 | 2.4 | - | - |
| Pre-workout Stimulants | 34.8 | 47.6 | - | 21.4 | 8.7 | 2.4 | 30.4 | 9.5 | 21.7 | 7.1 | 4.3 | 2.4 | - | 9.5 |
| Sports/Energy Gels | 91.4 | 95.2 | 8.7 | 2.4 | - | 2.4 | - | - | - | - | - | - | - | - |
| Fat Burners | 78.3 | 64.3 | 4.3 | 4.8 | - | 9.5 | - | 2.4 | - | 4.8 | 13 | 11.9 | 4.3 | 2.4 |
| Fat Metabolisers | 87 | 81 | - | - | - | 4.8 | - | 2.4 | - | 2.4 | 4.3 | 7.1 | 4.3 | 2.4 |
| Amino Acids | 43.5 | 64.3 | 8.7 | 7.1 | 4.3 | 7.1 | 4.3 | 2.4 | 13 | 4.8 | 13 | 14.3 | 13 | - |
| Testosterone Boosters | 91.3 | 100 | - | - | - | - | - | - | - | - | 8.7 | - | - | - |
| Conjugated Linoleic Acids | 91.3 | 97.6 | - | - | - | 2.4 | - | - | - | - | 4.3 | - | 4.3 | - |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L-Carnitine/Acetyl L-Carnitine | 65.2 | 78.6 | - | 4.8 | - | - | 8.7 | 2.4 | 4.3 | 4.8 | 17.4 | 9.5 | 4.3 | 9.5 |
| Creatine | 43.5 | 81 | 4.3 | 4.8 | 4.3 | - | 13 | 2.4 | 13 | 2.4 | 13 | 9.5 | 8.7 | - |
| 7-keto | 100 | 97.6 | - | - | - | - | - | - | - | - | - | 2.4 | - | - |
| Appetite Suppressants | 100 | 95.2 | - | - | - | - | - | - | - | - | - | 2.4 | - | 2.4 |
| Nitric Oxide Boosters | 82.6 | 97.6 | - | - | 4.3 | 2.4 | 4.3 | - | 4.3 | - | 4.3 | - | - | - |
| Condensed/Powdered Carbohydrates | 87.0 | 97.6 | - | - | - | 2.4 | 4.3 | - | 4.3 | - | 4.3 | - | - | - |
| Other | 82.6 | 100 | - | - | - | - | 4.3 | - | 4.3 | - | 4.3 | - | 4.3 | - |

### 3.5 Sex differences in Sports Supplement Use

#### *3.5.1 Drive for Muscularity Scale*

A 2 (male, female) x 2 (sports supplement use yes/no) univariate ANOVA revealed a significant main effect of sex on drive for muscularity, $F(1, 99) = 13.21$, $p < .001$. It also revealed a significant main effect of sports supplement use on drive for muscularity, $F(1, 99) = 37.63$, $p < .001$. These main effects were superseded by a significant interaction between sports supplement use and sex, $F(1, 99) = 5.05$, $p = .027$. (See Figure 1 below). Simple main effects revealed that male supplement users had significantly higher drive for muscularity ($M = 56.65$, $SD = 11.56$) than female supplement users ($M = 41.69$, $SD = 14.1$), $t(63) = 4.37$, $p < .001$, $d = 1.13$. There was no significant difference between males who did not use sports supplements ($M = 35.33$, $SD = 8.9$) and females who did not use sports supplements ($M = 31.81$, $SD = 8.22$), $t(36) = 1.2$, $p = .239$, $d = .50$.

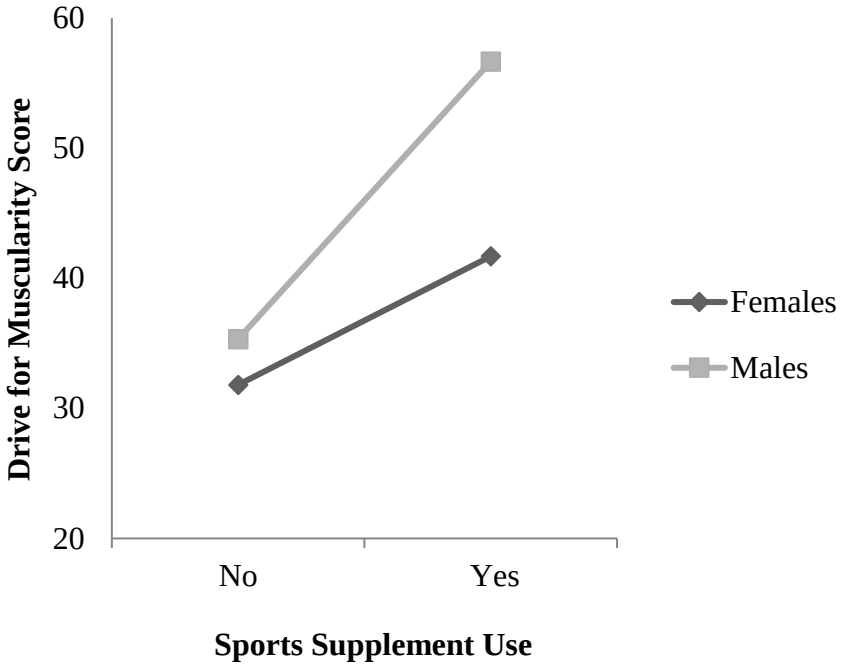


*Figure 1.* Significant interaction between sports supplement use and sex on drive for muscularity.

*3.5.2 Compulsive Attitudes towards Supplements Scale*

A univariate ANOVA revealed a significant main effect of sex on compulsive attitudes towards supplement use, $F(1, 99) = 5.67$, $p = .019$. It also revealed a significant main effect of sports supplement use on compulsive attitudes towards supplements, $F(1,99) = 35.88$, $p < .001$. There was a non-significant interaction between sports supplement and sex, $F(1, 99) = .501$, $p = .481$. Males who used supplements had significantly greater compulsive attitudes towards supplements ($M = 30.35$, $SD = 17.5$) than females who used sports supplements ($M = 20.76$, $SD = 14.35$). There was no significant difference between males who did not use sports supplements ($M = 9.58$, $SD = 15.97$) and females who did not use sports supplements ($M = 4.48$, $SD = 9.27$).

*3.5.3 Eating Disorder Examination Questionnaire*

An independent samples *t*-test revealed there was no significant difference between males who used sports supplements ($M = 45.17$, $SD = 23.73$) and females who used sports supplements ($M = 54.24$, $SD = 31.71$) on eating disorder symptomology, $t(56.89) = -1.303$, $p = .198$, $d = -.43$.

*3.5.4 Quality of Life*

An independent samples *t*-test revealed there was no significant difference between males who used sports supplements ($M = 34.43$, $SD = 6.9$) and females who used sports supplements ($M = 31.93$, $SD = 5.71$) on quality of life, $t(63) = 1.56$, $p = .124$, $d = .41$.

*3.5.5 Commitment to Exercise Scale*

An independent samples *t*-test revealed there was no significant difference between males who used sports supplements ($M = 42.57$, $SD = 17.8$) and females who used sports supplements ($M = 33.05$, $SD = 19.15$) on compulsive attitudes to exercise, $t(63) = 1.96$, $p = .054$, $d = .51$.

### 3.6 Reasons for supplement use

Reasons for supplement use were measured on a 5 point likert scale, with 1 being "not at all important" and 5 being "extremely important". The reasons for using sports supplements in the present study were changing appearance, improving performance, improving health and improving mood.

Correlation analysis revealed that drive for muscularity was significantly and positively associated with importance of using sports supplements to change appearance for males. Correlations also revealed that drive for muscularity was significantly and positively associated with importance of using supplements to change appearance, and to improve performance in females. See Table 2 for all correlations.

Table 2

*Correlations between drive for muscularity and the motivations for using supplements.*

| | Males (*n*= 23) | Females (*n*= 42) |
|---|---|---|
| Changing appearance | .638** | .511** |
| Improving performance | .188 | .545** |
| Improving health | -.261 | .121 |
| Improving mood | -.367 | .130 |

** = $p$ <.01.

Correlation analysis was also used to assess the relationship between frequency of the most used supplements which were protein and pre-work, and were the only supplements with enough usage for analysis, and scores on the CASS, EDE-Q, DMS, WHOQOL-BREF and the CES. The remaining supplements were not used frequently enough for analysis. Frequency of use was measured on a 7 point likert scale with the points being never, once a week or less, 2-3 times a week, 3-4 times a week, 5-6 times a week, daily (7 times a week)

and more than 7 times a week. Correlations here were calculated using non-parametric methods, namely Kendall's b, in preference to Pearson's r.

Correlation analysis revealed that frequency of protein and pre-workout use was significantly and positively correlated with scores on the CASS, DMS, WHOQOL-BREF and the CES. See Table 3 for correlation coefficients and significance values.

Table 3

*Correlations between protein, pre-workout, CASS, EDE-Q, DMS, WHOQOL-BREF, CES and motivations for using supplements*

| | Protein | Pre-workout | CASS | EDE-Q | DMS | WHOQOL-BREF | CES | Changing appearance | Improving performance | Improving health | Improving mood |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Protein | - | | | | | | | | | | |
| Pre-workout | .509** | - | | | | | | | | | |
| CASS | .446** | .399** | - | | | | | | | | |
| EDE-Q | -.007 | .063 | .065 | - | | | | | | | |
| DMS | .493** | .308** | .355** | .112 | - | | | | | | |
| WHOQOL-BREF | .201** | .153* | .045 | - .359** | -.019 | - | | | | | |
| CES | .235** | .280** | .385** | .200** | .291** | .064 | - | | | | |
| Changing appearance | .672** | .521** | .527** | .076 | .400** | .055 | .254** | - | | | |
| Improving performance | .385** | .398** | .259** | .201** | .370** | .031 | .341** | .365** | - | | |
| Improving health | .101 | .142 | .043 | .083 | .029 | .075 | .025 | .233 | .280* | - | |
| Improving mood | .049 | .127 | .033 | .094 | -.036 | -.039 | -.042 | .194 | .227 | .833** | - |

* = $p < .05$, ** = $p < .01$.

### 3.7 Correlates of supplement use

A series of one-way ANOVA's were performed to examine the differences between non-users, low frequency users and high frequency users of protein and pre-workout. Low frequency users were those who reported using the selected supplements 3-4 times a week or less, and high frequency users were those who reported using the selected supplements 5-6 times a week or more. See Tables 4 (protein) and 5 (pre-workout) for ANOVA results, means and standard deviations.

Table 4

*ANOVA results for differences between non-users, low and high frequency protein users on scores on the CASS, EDE-Q, DMS, WHOQOL-BREF and CES.*

| | Never (*n*=42) | Low frequency (*n*= 29) | High frequency (*n*= 32) | Test statistics | *p* value |
|---|---|---|---|---|---|
| | *M (SD)* [95%CI] | *M (SD)* [95%CI] | *M (SD)* [95%CI] | | |
| CASS | 9.05 (15.1) [4.35, 13.75] | 19.21 (16) [13.12, 25.29] | 26.94 (15.2) [21.46, 32.42] | $F(2, 100) = 12.54$ | <.001 |
| EDE-Q | 56.33 (32.07) [46.34, 66.36] | 45.28 (33.22) [32.64, 57.91] | 55.91 (25.1) [47.12, 59.05] | $F(2, 62.83) = 1.19$^ | .312 |
| DMS | 33.05 (9.55) [30.07, 36.03] | 41.41 (12.53) [36.65, 46.19] | 53.63 (13.77) [48.66, 58.59] | $F(2, 57.72) = 26.4$^ | <.001 |
| QOL | 30.24 (6.95) [28.1, 32.4] | 31.31 (6) [29.03, 33.59] | 34.88 (6.72) [32.26, 36.87] | $F(2,100) = 4.15$ | .019 |
| CES | 29.55 (17.08) [24.23, 34.87] | 28.93 (20.21) [21.24, 36.62] | 42.25 (15.99) [36.49, 48.02] | $F(2, 100) = 5.92$ | .004 |

^Welch correct *F* values. Note. CASS = Compulsive Attitudes towards Supplements Scale; EDE-Q = Eating Disorder Examination Questionnaire; DMS = Drive for Muscularity Scale; WHOQOL-BREF = World Health Organisation Brief Quality Of Life Assessment Scale; CES = Commitment to Exercise Scale.

Table 5

*ANOVA results for differences between non-users, low and high frequency pre-workout users on scores on the CASS, EDE-Q, DMS, WHOQOL-BREF and CES.*

| | Never (*n* = 66) | Low frequency (*n* = 23) | High frequency (*n* =14) | Test statistics | *p* value |
|---|---|---|---|---|---|
| | *M (SD)* [95% CI] | *M (SD)* [95% CI] | *M (SD)* [95% CI] | | |
| CASS | 11.92 (15.11) [8.21, 15.64) | 25.35 (18.5) [17.35, 33.35] | 30.64 (10.13) [24.8, 36.5] | *F*(2, 34.75) = 17.5^ | <.001 |
| EDE-Q | 51.29 (32.29) [43.66, 56.54] | 53 (30.84) [39.67, 66.33] | 60.21 (20.59) [48.33, 72.1] | *F*(2, 100) = .454 | .64 |
| DMS | 37.76 (13.66) [34.4, 41.12] | 46.74 (13.24) [41.01, 52.46] | 52.71 (13.65) [44.84, 60.59] | *F*(2, 100) = 8.98 | <.001 |
| QOL | 30.84 (6.75) [29.19, 32.51] | 34 (6.4) [31. 23, 36.77] | 33.29 (6.49) [29.54, 37.03] | *F*(2, 100) = 2.28 | .107 |
| CES | 28.02 (17.37) [23.75, 32.29] | 41.83 (15) [35.34, 48.31] | 44.36 (20.09) [32.76, 55.96] | *F*(2, 100) = 8.77 | <.001 |

^ Welch corrected *F* values. Note. CASS = Compulsive Attitudes towards Supplements Scale; EDE-Q = Eating Disorder Examination Questionnaire; DMS = Drive for Muscularity Scale; WHOQOL-BREF = World Health Organisation Brief Quality Of Life Assessment Scale; CES = Commitment to Exercise Scale.

*3.7.1 Protein*

Post-hoc tests revealed that there was a significant difference between non-users and low frequency users, $p = .020$, and high frequency users, $p < .001$, on the CASS, with both low and high frequency users having significantly greater compulsive attitudes towards supplements than non-users. There was no significant difference between low and high frequency users on the CASS. There were no significant differences between non-users, low frequency users and high frequency users on scores on the EDE-Q. There was a significant difference between non-users and low frequency users, $p = .010$, and high frequency users, $p < .001$, on the DMS, with both low and high frequency users having a significantly greater drive for muscularity than non-users. There was also a significant difference between low and high frequency users, $p = .002$, with high frequency users having a significantly greater drive for muscularity than low frequency users. There was a significant difference between non-users and high frequency users, $p = .016$, on scores on the WHOQOL-BREF, with high frequency users having significantly greater quality of life than non-users. There were no significant differences between non-users and low frequency users, or between low and high frequency users on quality of life. There was a significant difference between non-users and high frequency users, $p = 0.08$ on scores on the CES, with high frequency protein users having significantly greater compulsive attitudes towards exercise. There was also a significant difference between low and high frequency users, $p = .011$, on scores on the CES, with high frequency protein users having significantly greater compulsive attitudes towards exercise. There was no significant difference between non-users and low frequency users.

*3.7.2 Pre-workout*

There was a significant difference between non-users and low frequency users, $p = .01$, and high frequency users, $p < .001$ on scores on the CASS, with both low and high

frequency users having significantly greater compulsive attitudes towards supplements than non-users. There was no significant difference on low and high frequency users on scores on the CASS. There were no significant differences between non-users, low frequency users and high frequency users on scores on the EDE-Q. There was a significant difference between non-users and low frequency users, $p = .020$, and high frequency users, $p = .001$ on scores on the DMS, with both low and high frequency users having a significantly greater drive for muscularity than non-users. There was no significant difference between low and high frequency users on scores on the DMS. There were no significant differences between non-users, low frequency users and high frequency users on quality of life. There was a significant difference between non-users and low frequency users, $p = .004$, and high frequency users, $p = .005$, on scores on the CES, with both low and high frequency users having significantly greater compulsive attitudes towards exercise than non-users. There was no significant difference between low and high frequency users on scores on the CES.

### 3.8 Post-hoc analyses

To further examine the correlation between quality of life and increased frequency of protein and pre-workout use, Chi-square analyses were conducted to understand the proportions of different supplement use frequencies and their self-rated health. A one-way ANOVA was then used to analyse the differences between health status and quality of life, as it was hoped that health would explain the positive relationship between frequency of use and quality of life.

A Chi-square test revealed a significant association between frequency of protein use and health status, $\chi^2$ (8) = 17.37, $p = .026$, with 59.4% of high frequency users rating their health as very good or excellent, compared to only 27.6% of low frequency users and 31% of

non-users. There were no significant differences between pre-workout users on health status, $\chi^2$ (8) = 13.29, $p$ = .102.

A one-way ANOVA revealed significant differences between health status ratings and quality of life scores, $F(4, 98) = 9.41$, $p$ <.001. Post-hoc tests revealed that there was a significant difference between "fair" self-rated health and "very good" self-rated health, $p$ = .003, and "excellent" self-rated health, $p$ <.001, with both "very good" and "excellent" having a significantly higher quality of life than "fair". There was also a significant difference between "good" self-rated health and "excellent" self-rated health, $p$ <.001, with "excellent" having a significantly higher quality of life than "good".

## 4. Discussion

The aims of the current study were (1), to understand the motivations (changing appearance, improving performance, improving health and improving mood) and correlates of sports supplement use; and (2) to understand the sex differences of these motivations and correlates. From these aims the current study hypothesised that (1) male supplement users would have a significantly higher drive for muscularity than female supplement users, and (2) that male supplement users' drive for muscularity would be significantly associated with appearance based motivations for using sports supplements.

### 4.1 Sex differences in supplement use and key findings

The hypothesis that male supplement users would have a significantly higher drive for muscularity than female supplement users was supported. The hypothesis that male supplement users drive for muscularity would be significantly associated with appearance based motivations for using sports supplements was also supported. Other important findings

include the relationships between the motivations for using sports supplements and drive for muscularity. In male supplement users, drive for muscularity was significantly correlated with using supplements to change appearance. In female supplement users, drive for muscularity was significantly correlated with using supplements to change both appearance and to improve performance. Another key finding was that male supplement users had significantly greater compulsive attitudes towards supplements than female supplement users. Another important finding was that of the type and frequency of sports supplements used by males and females. It was revealed that females were more frequently using weight loss supplements than males. It was also revealed that both males and females were using supplements that increase muscle mass, although more males were using them more frequently than females. Finally, it was revealed that frequency of use was associated with greater compulsive attitudes towards supplements and exercise, greater drive for muscularity and greater quality of life.

### *4.1.1 Drive for Muscularity*

The key finding of male supplement users having a high drive for muscularity and this drive being significantly associated with using supplements to change appearance may be a behavioural manifestation of body image issues in male supplement users. Previous studies have found that in terms of body image concerns, males are worried about appearing too thin, lean and unmuscular (Field et al., 2005). They have also found that males have an elevated drive for increasing their size (Muller et al., 2009). The findings of the current study show an appearance based focus for male supplement users with a lack of focus on performance. Of particular significance is the appearance related drive for muscularity, as it may be a behavioural reflection of male body image issues. Objectification theory can help to explain the development of body image issues.

Objectification theory explains how both females and increasingly males are socialised to view themselves as objects to be viewed and judged on by others (Heath et al., 2015). This causes individuals to learn that their physical appearance is important and creates a preoccupation with appearance, which can then cause body image concerns (Heath et al., 2015). This increasing importance of physical appearance may be an explanation for the appearance based drive for muscularity in males. Objectification theory also explains that males are increasingly subjected to images and messages about the "ideal" muscular, large male body, which also can lead to body image concerns (Heath et al., 2015). This may also help to explain further the body image concerns in males and the preoccupation with appearance in male supplement users. A plausible explanation for the findings of body image issues in the present study is that males are trying to ascertain the "ideal" male body that they have been socialised to aspire to have. The growing prevalence of male body image concerns and the behaviours, such as supplement use, to overcome these issues is an important area of research. The findings from the present study further contribute to research into male body image issues and factors, such as drive for muscularity, that are associated with these issues.

In terms of female body image issues, previous research has found that females are concerned about weight, and become increasingly dissatisfied as weight increases, reflecting a desire to be thin (Field et al., 2005; Keating et al., 2016). Female supplement users in the present study were using weight loss supplements more frequently than males, possibly reflecting weight related body image concerns. Female supplement users in the present study also had a significantly lower drive for muscularity than male supplement users, showing a reduced desire to become more muscular. The drive for muscularity in female supplement users however was significantly correlated with using supplements to change appearance and improve performance. This shows that, unlike males, females are not only concerned with

improving their physical appearance but also improving their performance. The relationship between drive for muscularity with both appearance and performance based motivations for supplement use may be showing less of a focus on physical appearance and more of a focus on becoming stronger and fitter.

### *4.1.2 Attitudes towards supplements*

As previously stated, another key finding was that of compulsive attitudes towards supplement use. It was found that male supplement users had significantly greater attitudes toward sport supplements than female supplement users. It was also revealed that compulsive attitudes towards supplements was significantly associated with the importance of using supplements to change appearance and with using supplements to improve performance. Previous research has not assessed compulsive attitudes towards sports supplements but a plausible explanation for the compulsive attitudes towards supplements in male supplement users is that these attitudes are related to their appearance based body image concerns. Males may be more driven to use supplements in a compulsive way to help overcome their concerns about their appearance. Given that male body image concerns are becoming more prevalent, further research on the reasons for compulsive supplement attitudes are crucial.

### *4.1.3 Eating behaviours, quality of life and attitudes towards exercise*

The finding of no significant differences between male and female supplement users on eating disorder behaviours may be a reflection of the small sample size, as it is unlikely that there would be large numbers of individuals with significant eating disorder behaviours in the 65 supplement users. There was no significant difference between male and female supplement users on quality of life, suggesting that quality of life is similar between supplement users in general. There was also no significant difference between males and

females on attitudes towards exercise, however there was a moderate effect indicating males had greater compulsive attitudes towards exercise. It is plausible to suggest this is too related to male body image issues and that males are using both supplements and exercise to overcome these issues. Given that there was a positive relationship between compulsive attitudes and compulsive attitudes towards exercise, this further validates this explanation.

### 4.2 Supplement similarities to steroids

The relationship between appearance based motivations and drive for muscularity in males is also similar to findings in research about male steroid users (Murray et al., 2016). Research found that male anabolic steroid users who reported using steroids to improve their appearance had greater levels of body image symptomology than males who reported using steroids for improving performance (Murray et al., 2016). Another study on steroid use found that internalisation of cultural ideals of physical appearance and a heightened drive for muscularity were correlated with male anabolic steroid use (Parent & Moradi, 2011). Findings from the current study reflect these previous findings, with appearance based drive for muscularity in males, possibly showing similar patterns of body image concerns in male steroid users and in male supplement users. A study on the link between performance enhancing substances and supplements found that supplement users had significantly higher rates of performance enhancing substance use, as well as more positive attitudes towards doping and the belief that doping is effective (Backhouse et al., 2013). This relationship between performance enhancing substances and sports supplements suggests that supplements are a potential gateway to doping, given the attitudes supplement users have shown towards these substances (Backhouse et al., 2013). The appearance related body image issues present in both steroid and supplement users could also contribute to a gateway

between supplements and anabolic steroids. Given the increasing availability and ease of access to sports supplements, this relationship requires further examination.

### 4.3 Frequency of supplement use

The present study also examined the frequencies of sports supplements used by males and females. Previous research examining the different types of sports supplements being used by males and females has found that females were more likely than males to use supplements that encouraged weight loss (Muller et al., 2009). The findings of the present study suggest the same pattern of results, with more females reporting using weight loss supplements (e.g. fat burners) than males. Muller and colleagues (2009) also found that there was no significant differences between supplement use to increase body size between males and females. The present study found that although more males were using supplements to increase size and muscle mass (e.g. protein, creatine, amino acids) more frequently, females were also reporting using these supplements, although not as often as males. These findings suggest that, similar to Muller et al. (2009), both males and females are using sports supplements to increase their muscle mass and females are more frequently using weight loss supplements.

### 4.4 Correlates of sports supplement use

An aim of the current study was to understand the correlates of sports supplement use. This was done in two different ways in the present study. Correlations were used to analyse the relationship between frequency of use of protein and pre-workout and the CASS, EDE-Q, DMS, WHOQOL-BREF and the CES. Frequency of use was then broken into low and high frequency users and these groups were compared on their scores on the different measures.

This was not further broken down by sex as there were not enough numbers for each frequency category for suitable analysis.

The present study found a positive association between frequency of protein and pre-workout use and compulsive attitudes towards both supplements and exercise scores. Further examination found that both low and high frequency protein and pre-workout users had greater compulsive attitudes towards supplements and exercise than non-users, and that there was no difference between low and high frequency protein and pre-workout users on their compulsive attitudes. This indicates that frequency of supplement use has no effect on compulsive attitude towards supplement use, and that any supplement use leads to greater compulsive attitudes. An explanation for this finding comes from the relationship between compulsive attitudes towards supplements and the motivations for using supplements. Compulsive attitudes towards supplements was significantly associated with importance of using supplements to change appearance and improve performance. The increased importance placed on supplements to change appearance and performance could be making individuals compulsively use supplements, as indicated by their attitudes. This may indicate a kind of reliance on supplements to change appearance and performance.

Frequency of protein and pre-workout use was not significantly associated with eating disorder symptomology, nor were there any significant differences in frequency of use meaning that increased supplement use is not related to increased eating disorder symptomology. Given the small sample size, it was unlikely that prevalence of eating disorder behaviours would be high.

In terms of quality of life, there was a significant small association between frequency of both protein and pre-workout use and quality of life, indicating that more frequent

supplement use is associated with a greater quality of life. Further examination of this relationship revealed that this was likely due to increased self-rated health, which resulted in a higher quality of life. High frequency protein users had significantly greater self-rated health than low and non-users, and furthermore, those with higher self-rated health had greater quality of life. It may be the case that because supplement users are perceiving themselves as healthier, and possibly actually being healthier due to diet and exercise, than those who do not use supplements, this is increasing their quality of life.

Finally, the present study found that there were significant associations between frequency of both protein and pre-workout use and drive for muscularity, in that more frequent use of these supplements resulted in a greater drive for muscularity. For protein users, high frequency users had a significantly higher drive for muscularity than low frequency users, who in turn had a significantly high drive for muscularity than non-users. For frequency of pre-work out, there was a significant difference between non-users and low frequency users, and non-users and high frequency users. There was no significant difference between low and high frequency users of pre-workout. This is likely due to the fact that pre-workout does not increase muscle mass, unlike protein. These results show a clear effect of frequency of use on the drive for muscularity, with increased use of supplements being related to increased drive for muscularity. With the relationship between drive for muscularity and sports supplements already established, it is important to take into account frequency of use and how this further impacts drive for muscularity. This is especially important for males, as their drive for muscularity is significantly associated with using supplements to change appearance and therefore likely associated with body image issues.

These results about the correlates of sports supplement use provides extremely important information about sports supplement use and what psychological factors are associated with their use. Given that there is no previous research on the correlates of sports supplement use, the present study provides a starting point for further investigation and interpretation of how these correlates may affect sports supplements users.

### 4.5 Motivations for supplement use

In terms of the reasons and motivations for using sports supplements, previous studies have found that the primary motivation for using supplements is to improve health and stay healthy (Lieberman et al., 2015; Wiens et al., 2014). The current study did not find similar results to these studies. The present study found that changing appearance and improving performance were the primary reasons for using sports supplements. Improving health and improving mood were the least selected reasons for using sports supplements, which differs from previous research where improving health was the primary reason for using sports supplements (Lieberman et al., 2015; Wiens et al., 2014; Parnell et al., 2015). There are two explanations for why the current study did not find similar results to previous research on motivations for supplement use. One is that the previous studies did not include changing appearance as a reason for using sports supplements. The inclusion of this option in the present study allowed for a broader understanding of different motivations behind sports supplement usage. Another explanation for the different results are that previous studies did not differentiate between dietary supplements, such as multivitamins and sports supplements. The combining of these two categories of supplements may explain why health motivations were more prominent in previous research. The current study did not combine these categories as to more clearly understand the reasons and motivations for using sports supplements, rather than both sports supplements and dietary supplements. In doing this, the

current study was able to gain a deeper understanding of the reasons for using sports supplements.

### 4.6 Limitations

There were several limitations to the present study. The primary limitation was the small sample size. The present study only had 103 participants and of these, only 65 reported using sports supplements. This small sample size meant that the motivations for sports supplement use could not be fully examined and understood, or generalised to the broader community. It also meant that frequency of use was not able to be split by sex, which would have provided further information about the relationship between frequency of use and the correlates of sports supplements. Also regarding frequency of use, the present study was limited with the types of supplements that could be assessed for frequency, which in this case were protein powders and shakes, and pre-workout stimulants.

There were very small numbers of participants who reported using sports supplements for improving health and improving mood, meaning that results from these reasons are not reliable. Although these reasons were not the main focus of the current study, future research in this area with a larger sample size would provide more insightful, generalisable information.

Another limitation was the uneven number of males and females in the study. There were significantly more females than males that participated in the current study. Although there was no significant differences between the proportions of male and female supplement users, a more even distribution of the sexes would have provided more information about male supplement users. As there were only 23 male supplement users in the current study, the results from male supplement users can not be applied to the broader population.

A further limitation was that the sample for this study was from the general population and first year psychology students. Although supplement users were targeted by advertising in gyms, sporting goods stores and supplement stores, there were no restrictions on who could complete the survey. Had the study consisted of a different target population, such as physique based athletes (body builders, fitness models etc) then there may have been more significant results on the other measures, such as the EDE-Q, WHOQOL-BREF and the CES, which would help to further understand the correlates of sports supplements.

Finally, it is important to touch on the self report nature of the current study. Self report relies on participants honestly and accurately reporting information about themselves. This can often lead to participants trying to portray themselves in a more positive way, known as self-desirability responding or bias (van de Mortel, 2008). It is important to be aware of this when using and reporting self-reported data.

### 4.7 Implications

The results from the current study have several implications. The findings of body image issues in male supplement users presents the need for awareness of these issues, in both the community and mental health professionals. Awareness of these issues could lead to more informed and targeted treatment for those who experience body image issues, and allow for greater understanding of behaviours, such as supplement use, that could be associated with body image issues.

The development of health education programs regarding the adverse effects of sports supplements is another practical implication of the present study. Studies have shown the negative side effects of particular supplements (Calfee & Fadale, 2006) and presence of endocrine disruptors in a range of supplements (Plotan et al., 2015). The present study also

revealed adverse psychological effects, namely possible body image issues and compulsive attitudes towards supplements, of sports supplement use. Given the adverse psychological effects of supplements, the more frequent use of supplements in males and compulsive attitudes towards supplements in males, these programs should target those most at risk of experiencing issues associated with using supplements, namely males.

Finally, the current study may have theoretical implications. At present there are no theories to explain or describe the underlying psychological processes, or to understand the motivations, involved in using sports supplements. As the current study assessed psychological correlates of sports supplement use, such as, attitudes, quality of life and drive for muscularity, there may be scope for future research to develop theories to understand and explain the correlates and motivations involved in using sports supplements.

### 4.8 Recommendations

Future research in this area would benefit from having a larger sample size to better understand the relationship between supplements and body image. This would help to further understand the motivations for using sports supplements and to further examine the correlates of supplement use. It is also recommended that future studies have more equal numbers of males and females. This would allow for better understanding of the sex differences in sports supplement use, motivations for using supplements and the different correlates of supplement use.

It is also recommended that future research take a more targeted approach when recruiting for studies in this area, with more of a focus on individuals who are more likely to use supplements, such as those who are involved in physique based sports. Future studies

should consider involving only supplement users, as this could provide more thorough information about sports supplement use.

With the results of the current study showing a preoccupation with appearance based drive for muscularity in males, it is recommended that more serious body image disorders be considered in future research. Muscle Dysmorphia is a severe body image disorder, where individuals believe their body is small and weak when it is not (Foster et al., 2015). Including a measure to assess Muscle Dysmorphia, such as the Muscle Dysmorphia Disorder Inventory (Hildebrandt et al., 2004), will allow for the examination of more serious body image issues that may be present in sports supplement users.

### 4.9 Conclusions

In sum, the current findings suggest that sports supplement use is associated with potentially problematic outcomes, such as an increased drive for muscularity and greater compulsive attitudes towards sports supplement use. In males, this drive for muscularity may be reflective of body image issues, as it was associated with using supplements only to change appearance. This drive for muscularity was associated both using supplements to change appearance and improve performance, suggesting a focus on not only physical appearance but also on fitness. However, increased used of supplements was also associated with better quality of life, suggesting both adverse and positive correlates of use. The frequency of certain supplements was also found to be associated with increased drive for muscularity, more compulsive attitudes towards supplements and exercise and increased quality of life. Notwithstanding the limitations of a small sample size from the general population, the present study provides valuable information about the motivations and correlates of sports supplement use. Future research involving a greater number of

participants and a more focused approach on recruiting those who use sports supplements would be useful in informing professionals and the community, and to develop education programs to inform individuals of the associated outcomes of sports supplement use.

## 5. References

Austin, S. B., Yu, K., Liu, S. H., Dong, F., & Tefft, N. (2017). Household expenditure on dietary supplements sold for weight loss, muscle building and sexual function: Disproportionate burden by gender and income. *Preventative Medicine Reports, 6,* 236-241, doi: 10.1016/j.pmedr.2017.03.016

Backhouse, S. H., Whitaker, L., & Petroczi, A. (2013). Gateway to doping? Supplement use in the context of preferred competitive situations, doping attitude, beliefs, and norms. *Scandinavian Journal of Medicine and Science in Sports, 23,* 244-252, doi: 10.1111/j.1600-0838.2011.01374.x

Bailey, V., Baker, A-M., Cave, L., Fildes, J., Perrens, B., Plummer, J., & Wearring, A. (2016). Mission Australia's 2016 Youth Survey Report, Mission Australia.

Calfee, R., & Fadale, P. (2006). Popular Ergogenic Drugs and Supplements in Young Athletes. *Pediatrics, 117* (3), 577-589. doi: 10.1542/peds.2005-1429.

Calogero, R. M., Davis, W., & Thompson, J. K. (2005). The role of self-objectification in the experience of women with eating disorders. *Sex Roles, 52,* 43–50. doi: http://dx.doi.org/10.1007/s11199-005-1192-9

Chen, F., & Russo, N. (2010). Measurement invariance and the role of body consciousness in depressive symptoms. *Psychology of Women Quarterly, 34,* 405– 417. doi: http://dx.doi.org/10.1111/j.1471-6402.2010.01585.x

Cohen, J. (1988). Statistical power analysis for the behavioural sciences (2nd ed.). Hillsdale, NJ: Erlbaum.

Davis, C., Brewer, H., & Ratusny, G. (1993). Behavioral frequency and psychological commitment: Necessary concepts in the study of excessive exercising. *Journal of Behavioral Medicine, 16,* 611–628. doi: 10.1007/BF00844722

Engel, G.L. (1977). The need for a new medical model: a challenge for biomedicine. *Science,196,* 129–136. doi: 10.1126/science.847460

Fairburn, C.G., & Beglin, S.J. (1994). Assessment of eating disorders: interview or self-report questionnaire? *International Journal of Eating Disorders*, 16, 363-370.

Field, A. E., Austin, S. B., Camargo, C. A., Taylor, C. B., Striegel-Moore, R. H., Loud, K. J., & Colditz, G. A. (2005). Exposure to the Mass Media, Body Shape Concerns, and Use of Supplements to Improve Weight and Shape Among Male and Female Adolescents. *Pediatrics, 116*(2), 214-220, doi: 10.1542/peds.2004-2022

Foster, A.C., Shorter, G. W., & Griffiths, M. D. (2015). Muscle dysmorphia: Could it be classified as an addiction to body image? *Journal of Behavioral Addictions, 4*(1), 1-5, doi: 10.1556/JBA.3.2014.001

Grieve, F.G. (2007). A conceptual model of factors contributing to the development of muscle dysmorphia. *Eating Disorders, 15*(1), 63–80. doi: 10.1080/ 10640260601044535

Heath, B., Tod, D. A., Kannis-Dymand, L., & Lovell, G. P. (2015). The Relationship Between Objectification Theory and Muscle Dysmorphia Characteristics in Men. *Psychology of Men & Muscularity, 17*(3). doi: http://dx.doi.org/10.1037/men0000022

Hildebrandt, T., Langenbucher, J., & Schlundt, D. G. (2004). Muscularity concerns among men: Development of attitudinal and perceptual measures. *Body Image, 1(2),* 169-181. doi:10.1016/j.bodyim.2004.01.001

Ip, E.J., Barnett, M. J., Tenerowicz, M. J., & Perry, P. J. (2011). The Anabolic 500 Survey: Characteristics of Male Users versus Nonusers of Anabolic-Androgenic Steroids for Strength Training. *Pharmacotherapy, 31*(8), 757-766

Keating, C., & Stephens, J., Thomas, N., Castle, D. J., & Rossell, S. L. (2016). Gender differences in weight-related and non-weight-related appearance concerns in a community sample. *Australian Journal of Psychology, 68*(1), 11-19. doi: 10.1111/ajpy.12092

Kessler, R.C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S., Walters, E. E., & Zaslavsky, A. M. (2002) Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine, 32,* 959-956.

Leone, J. E., Sedory, E. J., & Gray, K. A. (2005). Recognition and Treatment of Muscle Dysmorphia and Related Body Image Disorders. *Journal of Athletic Training, 40*(4), 352-359

Lieberman, H. R., Marriott, B. P., Williams, C., Judelson, D. A., Glickman, E. L., Geiselman, P. J., Dotson, L., & Mahoney, C. R. (2015). Patterns of dietary supplement use among college students. *Clinical Nutrition, 34*, 976-985. doi: https://doi.org/10.1016/j.clnu.2014.10.010

McCreary, D.R., & Sasse, D.K. (2000). An exploration of the drive for muscularity in adolescent boys and girls. *Journal of American College Health, 48*, 297-304.

Mond, J. M., Hay, P. J., Rodgers, B., Owen. C., & Beumont, P. J. V. (2004). Validity of the Eating Disorder Examination Questionnaire (EDE-Q) in screening for eating disorders in community samples. *Behaviour Research and Therapy, 42,* 551-567, doi: 10.1016/S0005-7967(03)00161-X

Morris, L. J., Gizis, F., & Shorter, B. (2004). Prevalent Use of Dietary Supplements Among People Who Exercise At a Commercial Gym. *International Journal of Sport Nutrition and Exercise Metabolism, 14*(4), 481-492. doi: 10.1123/ijsnem.14.4.481

Muller, S., Gorrow, T., & Schneider, S. (2009). Enhancing Appearance and Sports Performance: Are Female Collegiate Athletes Behaving More Like Males? *Journal of American College Health, 57*(5), 513-520. doi: http://dx.doi.org/10.3200/JACH.57.5.513-520

Murray, S., Griffiths, S., Mond, J., Kean, J., & Blashill, A. (2016). Anabolic steroid use and body image psychopathology in men: Delineating between appearance- versus performance driven motivations. *Drug and Alcohol Dependence, 165*, 198-202. doi: 10.1016/j.drugalcdep.2016.06.008

Neumark-Sztainer, D., & Eisenberg, M. E. (2014). Body Image Concerns, Muscle-Enhancing Behaviors, and Eating Disorders in Males. *Journal of the American Medical Association, 312*(20), 2156-2157. doi: 10.1001/jamapediatrics.2013.2915

O'Dea, J. A. (2003). Consumption of nutritional supplements among adolescents: usage and perceived benefits. *Health Education Research, 18*(1), 98-107. doi: 10.1093/her/18.1.98

Parent, M. C., & Moradi, B. (2011). His Biceps Become Him: A Test of Objectification Theory's Application to Drive for Muscularity and Propensity for Steroid Use in College Men. *Journal of Counseling Psychology, 58*(2), 246-256. doi: 10.1037/a0021398

Parnell, J. A., Wiens, K., & Erdman, K. (2015). Evaluation of congruence among dietary supplement use and motivation for supplementation in young, Canadian athletes.

*Journal of the International Society of Sports Nutrition, 12,* 1-10. doi:10.1186/s12970-015-0110-y

Pingitore R, Spring B, Garfield D. (1997). Gender differences in body satisfaction. *Obesity Research, 5*(5), 402–409.

Plotan, M., Elliot, C. T., Frizzell, C., & Connolly, L. (2015). Estrogenic endocrine disruptors present in sports supplements. A risk assessment for human health. *Food Chemistry, 159,* 157-165, doi: 10.1016/j.foodchem.2014.02.153

Schneider, C., Rollitz, L., Voracek, M., & Hennig-Fast, K. (2016). Biological, Psychological, and Sociocultural Factors Contributing to the Drive for Muscularity in Weight-Training Men. *Frontiers in Psychology, 7,* 1-11. doi: 10.3389/fpsyg.2016.01992

Silberstein, L. R., Striegel-Moore, R. H., Timko, C., & Rodin, J. (1988). Behavioral and psychological implications of body dissatisfaction: Do men and women differ? *Sex Roles, 19* (3-4), 219–232.

Tod, D., & Lavallee, D. (2010). Towards a conceptual understanding of muscle dysmorphia development and sustainment. *International Review of Sport and Exercise Psychology, 3,* 111–131, doi: http://dx.doi.org/10 .1080/17509840903428513

van de Mortel, T. F. (2008). Faking it: social desirability response bias in self-report research. *Australian Journal of Advanced Nursing, 25*(4), 40-48

WHOQOL Group, WHOQOL Group (1998): Development of the World Health Organisation WHOQOL-BREF quality of life assessment. *Psychological Medicine, 28,* 551–558

Wiens, K., Erdman, K., Stadnyk, M., & Parnell, J. A. (2014). Dietary Supplement Usage, Motivation, and Education in Young Canadian Athletes. *International Journal of Sport Nutrition and Exercise Metabolism, 24*(6), 613-622

# 6. Appendices

## 6.1 Appendix A - Ethics Approval letter

Social Science Ethics Officer
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Katherine.Shaw@utas.edu.au

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

UTAS

09 May 2017

Dr Daniel Zuj
Division of Psychology
University of Tasmania

Student Researcher: Marni Ansell

*Sent via email*

Dear Dr Zuj

Re: FULL ETHICS APPLICATION APPROVAL
Ethics Ref: **H0016483 - Motivations for sports supplement use in Tasmania**

We are pleased to advise that the Tasmania Social Sciences Human Research Ethics Committee approved the above project on 08 May 2017.

This approval constitutes ethical clearance by the Tasmania Social Sciences Human Research Ethics Committee. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approval of other bodies or authorities is required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.

2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.

3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.

5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**

6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely

Katherine Shaw
Executive Officer
Tasmania Social Sciences HREC

## 6.2 Appendix B - Copy of survey

## SECTION 1 - Demographics and Supplement Use

---

**1.1 What is your age (in years):** .....

**1.2 What is your sex:**

- ☐ Male[1]
- ☐ Female[2]
- ☐ Other (please specify)[3]

To create a non-identifiable ID number, please write either your first OR last initial and the last 3 digits of your phone number:

.....

**1.3 What is your current relationship status?**

- ☐ Single, never married[1]
- ☐ Single, separated or divorced[2]
- ☐ Married or living as married (cohabiting with partner)[3]
- ☐ Other (please specify)[4]

**1.4 What is your <u>main</u> activity at present? (tick one box only)**

- ☐ In paid work full-time[1]
- ☐ In paid work part-time[2]
- ☐ Full-time student[3]
- ☐ Home duties/caring for children[4]
- ☐ Seeking paid work[5]
- ☐ Other (please specify)[6]

**1.5 What is the highest level of education you have completed? (tick one box only)**

- ☐ Year 10[1]
- ☐ Year 12[2]
- ☐ Trade certificate/apprenticeship[3]
- ☐ Undergraduate diploma[4]
- ☐ Bachelor's degree[5]
- ☐ Postgraduate degree or diploma[6]

**1.6 In which country were you born?**

- ☐ Australia[1]
- ☐ Other (please specify)[2]

**1.7 What is your first language?**

- ☐ English[1]
- ☐ Other (please specify)[2]

**1.8 What is the postcode of the suburb where you currently live?** .....

**1.9 What is your current weight in kilograms?** .....

**1.10 What is your current height in centimetres?** .....

**1.11 What was your highest weight as an adult? .....**

**1.12 What was your lowest weight as an adult? .....**

**1.13 What is your ideal weight in kilograms:** .....

**1.14 Are you a member of a gym?**

- ☐ No[1]
- ☐ Yes[2]

**1.15 Over the past 4 weeks, how often have you done mild exercise, such as a gentle walk (choose the best/closest option)?**

- ☐ Never[0]
- ☐ Once a week or less[1]
- ☐ 2-3 times a week[2]
- ☐ 3-4 times a week[3]
- ☐ 5-6 times a week[4]
- ☐ Daily (7 times a week)[5]
- ☐ More than 7 times a week[6]

**1.16 On average, approximately how long do you spend on a mild exercise session? (in minutes) .....**

**1.17 Over the past 4 weeks, how often have you done moderate exercise, such as riding a bike (choose the best/closest option)?**

- ☐ Never[0]
- ☐ Once a week or less[1]
- ☐ 2-3 times a week[2]
- ☐ 3-4 times a week[3]
- ☐ 5-6 times a week[4]
- ☐ Daily (7 times a week)[5]
- ☐ More than 7 times a week[6]

**1.18 On average, approximately how long do you spend on a moderate exercise session? (in minutes) .....**

**1.19 Over the past 4 weeks, how often have you done hard exercise, such as running, weightlifting or aerobics (choose the best/closest option)?**

- ☐ Never[0]
- ☐ Once a week or less[1]
- ☐ 2-3 times a week[2]
- ☐ 3-4 times a week[3]
- ☐ 5-6 times a week[4]
- ☐ Daily (7 times a week)[5]
- ☐ More than 7 times a week[6]

**1.20 On average, approximately how long do you spend on a hard exercise session? (in minutes) .....**

**1.21 What types of exercise do you do at present? (select all that apply)**

- ☐ Cardio workout (running, swimming, rowing, etc)[1]
- ☐ Recreational weightlifting (non-competitive)[2]
- ☐ Competition physique training (e.g bodybuilding, physique-based competitions)[3]
- ☐ Strength Conditioning[4]
- ☐ Power Lifting[5]
- ☐ Team-based Sports[6]
- ☐ Other (Please specify)[7]

**1.22 How important is changing your appearance (e.g. changing weight, shape or muscle tone) as a reason for your exercise?**

- ☐ 1 (not at all important)
- ☐ 2 (somewhat important)
- ☐ 3 (moderately important)
- ☐ 4 (very important)
- ☐ 5 (extremely important)

**1.23 How important is improving your performance(e.g. strength and/ or cardiovascular fitness) as a reason for exercise?**

- ☐ 1 (not at all important)
- ☐ 2 (somewhat important)
- ☐ 3 (moderately important)
- ☐ 4 (very important)

☐ 5 (extremely important)

**1.24 How important is improving your general health and well being as a reason for exercise?**

☐ 1 (not at all important)
☐ 2 (somewhat important)
☐ 3 (moderately important)
☐ 4 (very important)
☐ 5 (extremely important)

**1.25 How important is improving your mood (reducing stress or negative emotions) as a reason for exercise?**

☐ 1 (not at all important)
☐ 2 (somewhat important)
☐ 3 (moderately important)
☐ 4 (very important)
☐ 5 (extremely important)

**1.26 How would you classify your athletic status?**

☐ Non-athlete[1]
☐ Beginner[2]
☐ Intermediate[3]
☐ Professional[4]
☐ Other (Please specify)[5] .....

**1.27 In general, would you say your health is:**

☐ Poor[1]
☐ Fair[2]
☐ Good[3]
☐ Very good[4]
☐ Excellent[5]

**1.28 Do you ever have "cheat meal days" when following a diet, i.e. days where you forget about your diet and eat any foods you want?**

☐ No[1]
☐ Yes[2]

**1.29 If yes, how many such days have you had during the past 4 weeks? .....**

**1.30 Do you have any food intolerances? (e.g. lactose, gluten).**

☐ No[1]

☐ Yes[2]
☐ Other, please specify[3] .....

**1.31 On average, how many cups of coffee do you consume per day? .....**

**1.32 Do you ever consume any of the following drinks to give you the motivation/drive/energy to complete a work out? Select all that apply.**

☐ Pre-workout Stimulants[1]
☐ Energy Drinks (e.g. redbull)[2]
☐ Coffee[3]
☐ Other, please specify[4] .....

**1.33 Do you take currently take dietary supplements, such as vitamins or minerals?**

☐ No[1] (If no, go to question **1.41**)
☐ Yes[2]

**1.34 If yes, what sort of dietary supplements do you take? (tick all that apply).**

☐ Specific vitamins and minerals[1] (e.g. vitamin B, C or D, calcium)
☐ Multivitamins[2]
☐ Fish Oil[3]
☐ Bone/joint/cartilage supplements (e.g. Glucosamine, Chondroitin)[4]
☐ Herbal supplements (e.g. Ginseng, green tea extract, Echinacea)[5]
☐ Other, please specify[6] .....

**1.35 Over the past 4 weeks, approximately how much money have you spent on dietary supplements? .....**

**1.36 How important is changing your appearance (changing weight, shape or muscle tone) as a reason for taking dietary supplements?**

☐ 1 (not at all important)
☐ 2 (somewhat important)
☐ 3 (moderately important)
☐ 4 (very important)
☐ 5 (extremely important)

**1.37 How important is improving your performance (e.g. strength and/or cardiovascular fitness) as a reason for taking dietary supplements?**

☐ 1 (not at all important)
☐ 2 (somewhat important)

☐ 3 (moderately important)
☐ 4 (very important)
☐ 5 (extremely important)

**1.38 How important is improving your general health and wellbeing as a reason for taking dietary supplements?**

☐ 1 (not at all important)
☐ 2 (somewhat important)
☐ 3 (moderately important)
☐ 4 (very important)
☐ 5 (extremely important)

**1.39 How important is improving your mood (reducing stress or negative emotions) as a reason for taking dietary supplements?**

☐ 1 (not at all important)
☐ 2 (somewhat important)
☐ 3 (moderately important)
☐ 4 (very important)
☐ 5 (extremely important)

**1.40 How long have you used dietary supplements for? (in years/months) .....**

**1.41 Do you currently take sports supplements, such as protein/whey powders or shakes, fat burners etc?**

☐ No[1] (If no, go to question **1.84**).
☐ Yes[2]

**During the <u>past 4 weeks</u>, how often have you used each of the following sports supplements:**

| | Never | Once a week or less | 2-3 times a week | 3-4 times a week | 5-6 times a week | Daily (7 times a week) | More than 7 times a week |
|---|---|---|---|---|---|---|---|
| **1.42 Protein powders/shakes** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.43 Protein Bars** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.44 Pre-workout Stimulants** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.45 Sports/energy Gels** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.46 Fat Burners** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.47 Fat Metabolisers** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.48 Amino Acids (e.g. Glutamine, Branch Chain Amino Acids, Citruline, Beta-alanine etc)** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.49 Testosterone Boosters** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.50 Conjugated Linoleic Acids** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.51 L-Carnitine/ Acetyl L-Carnitine** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.52 Creatine** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.53 7-keto** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.54 Appetite suppressants** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.55 Nitric Oxide Boosters** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.56 Condensed/powdered Carbohydrates** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **1.57 Others (please specify below)** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |

**When taking the following supplements, how much do you take? Please tick the box that is most**

| | Less than the recommended serving | The recommended serving | More than the recommended serving |
|---|---|---|---|
| **1.58 Protein Powders/shakes** | | | |
| **1.59 Protein Bars** | | | |
| **1.60 Pre-workout Stimulants** | | | |
| **1.61 Sports/Energy Gels** | | | |
| **1.62 Fat Burners** | | | |
| **1.63 Fat Metabolisers** | | | |
| **1.64 Amino Acids (e.g. Glutamine, Branch Chain Amino Acids, Citruline, Beta-alanine etc)** | | | |
| **1.65 Testosterone Boosters** | | | |
| **1.66 Conjugated Linoleic Acid** | | | |
| **1.67 L-Carnitine/ Acetyl L-Carnitine** | | | |
| **1.68 Creatine** | | | |
| **1.69 7-keto** | | | |
| **1.70 Appetite Suppressants** | | | |
| **1.71 Nitric Oxide Boosters** | | | |
| **1.72 Condensed/powdered Carbohydrates** | | | |
| **1.73 Other (please specify below)** | | | |
| | | | |
| | | | |

**1.74 Over the past 4 weeks, approximately how much money have you spent on sports supplements? .....**

**1.75 How long have you used sports supplements for? (in years/months)** .....

**1.76 When you first started using sports supplements, was it more for: (select one box only).**

- ☐ Appearance[1]
- ☐ Performance[2]
- ☐ Health[3]
- ☐ Improving mood[4]

**1.77 How important is changing your appearance (e.g. changing weight, shape or muscle tone) as a reason for using sports supplements?**

- ☐ 1 (not at all important)
- ☐ 2 (somewhat important)
- ☐ 3 (moderately important)
- ☐ 4 (very important)
- ☐ 5 (extremely important)

**1.78 How important is improving your performance ( e.g., strength, cardiovascular fitness) as a reason for using sports supplements?**

- ☐ 1 (not at all important)
- ☐ 2 (somewhat important)
- ☐ 3 (moderately important)
- ☐ 4 (very important)
- ☐ 5 (extremely important)

**1.79 How important is improving your general health and wellbeing as a reason for using sports supplements?**

- ☐ 1 (not at all important)
- ☐ 2 (somewhat important)
- ☐ 3 (moderately important)
- ☐ 4 (very important)
- ☐ 5 (extremely important)

**1.80 How important is improving your mood (reducing stress or negative emotions) as a reason for taking sports supplements?**

- ☐ 1 (not at all important)
- ☐ 2 (somewhat important)
- ☐ 3 (moderately important)
- ☐ 4 (very important)

☐ 5 (extremely important)

**1.81 Have you had any negative effects from sports supplement use?**

☐ No[1]
☐ Yes[2]

**1.82 If yes, what were these negative effects? If no, proceed to question 1.83.**

| |
|---|
| |

**1.83 Have you ever sought any professional advice, for example from a dietician or nutritionist, GP (doctor) or personal trainer, regarding sports supplement use?**

☐ GP (doctor)[1]
☐ Dietician[2]
☐ Personal trainer[3]
☐ Other (please specify)[4] .....
☐ I have never sought professional advice regarding sports supplement use[5]

**1.84 Have you ever used any of the following substances? Select all that apply (remember, all your answers are anonymous). If you have never used any such substances, go to question 1.87.**

☐ Anabolic Steroids[1] (e.g. anadrol, dianabol)
☐ Blood boosters[2] (e.g. recombinant human erythpoietin)
☐ Human Growth Hormone[3]
☐ Human biomolecules[4]
☐ Other, please specify[5] .....

**1.85 If yes, when was your most recent dosage?**

- ☐ In the past month[1]
- ☐ In the past 3 months[2]
- ☐ In the past 6 months[3]
- ☐ In the past 12 months[4]
- ☐ Not in the past 12 months[5]

**1.86 If yes, was it <u>primarily</u> for: (select only one box)**

- ☐ Appearance[1]
- ☐ Performance[2]
- ☐ Health[3]
- ☐ Improving mood[4]

**1.87 If no, have you ever <u>considered</u> taking any of the following substances? Select all that apply.**

- ☐ Anabolic Steroids[1] (e.g. anadrol, dianabol)
- ☐ Blood boosters[2] (e.g. recombinant human erythpoietin)
- ☐ Human Growth Hormone[3]
- ☐ Human biomolecules[4]
- ☐ Other, please specify[5]

## SECTION 2- Attitudes towards Sports Supplement Use

The following questions are about your attitudes towards sports supplements. For each question, circle the number on the line underneath each statement which best describes how you feel …

**2.1 How important is it to your general well-being not to miss a dosage of sports supplements?**

0____1____2____3____4____5____6____7____8____9____10

Not important Very important

**2.2 Does it upset you if, for one reason or another, you are unable to use sports supplements?**

0____1____2____3____4____5____6____7____8____9____10

Never upset Always upset

**2.3 If you miss a dosage of sports supplements, do you make up for it later? (e.g. take a higher dosage, change your diet or exercise harder later)?**

0____1____2____3____4____5____6____7____8____9____10

Never Always

**2.4 Do you continue to use sports supplements when you feel tired or unwell?**

0____1____2____3____4____5____6____7____8____9____10

Never Always

**2.5 Do you continue to use sports supplements if you are injured or not training/exercising?**

0____1____2____3____4____5____6____7____8____9____10

Never Always

**2.6 Are there times when you turn down an invitation to an interesting social event because it would interfere with your sports supplement use (e.g., invitations to events that involve eating or drinking alcohol at times when you would usually take supplements)?**

0____1____2____3____4____5____6____7____8____9____10

Never Always

**2.7 Do you have a set routine for taking sports supplements, such as taking supplements in a certain order or at certain times each day?**

0____1____2____3____4____5____6____7____8____9____10

No routine Strict routine

**2.8 Do you feel "guilty" that you have "let yourself down" if you miss a dosage of sports supplements?**

0____1____2____3____4____5____6____7____8____9____10

Not at all A great deal

## SECTION 3 - Eating Behaviours

The following questions are only concerned with the past 4 weeks (28 days).

| On how many of the past 28 days... | 0 | 1-5 | 6-12 | 13-15 | 16-22 | 23-27 | Every day |
|---|---|---|---|---|---|---|---|
| **3.1 Have you been deliberately trying to limit the amount of food you eat in order to influence your shape or weight?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.2 Have you gone for long periods of time (8 waking hours or more) without eating anything in order to influence your shape or weight?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.3 Have you tried to avoid eating any foods that you like in order to influence your weight or shape?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.4 Have you tried to follow definite rules about your eating in order to influence your shape or weight? (like a calorie limit or rules about when, what or how much you should eat)** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.5 Have you felt fat or 'out of shape'?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.6 Has thinking about your weight or shape made it more difficult to concentrate on things that you are interested in (like reading a book, watching TV, or chatting with friends)?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.7 Have you had a strong desire to lose weight or gain muscle?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.8 Have you had a definite fear that you might become fat or 'out of shape'?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.9 Have you wanted your stomach to be completely flat or 'rock hard'?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |

| | Not at all | | Slightly | | Moderately | | Markedly |
|---|---|---|---|---|---|---|---|
| **In the past 28 days…** | | | | | | | |
| (for each question tick one box only to give your answer) | | | | | | | |
| **3.10 How dissatisfied have you felt about your weight?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.11 Has your weight influenced how you think about (judge) yourself as a person?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.12 How dissatisfied have you felt about your shape?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.13 Has your shape influenced how you think about (judge) yourself as a person?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.14 How much would it upset you if you had to weigh yourself once a week for the next 4 weeks?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.15 How uncomfortable have you felt seeing your body (like in the mirror, in shop window reflections, while undressing or taking a bath or shower)?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **3.16 How uncomfortable have you felt about others seeing your body (like in communal changing rooms, when swimming or when wearing tight clothes)?** | ☐0 | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |

**3.17 Over the past 28 days how many <u>times</u> have you eaten what other people would regard as an unusually large amount of food (given the circumstances)?** .....

**3.18 On how many of these <u>times</u> did you have a sense of having lost control over your eating (at the times you were eating)?** .....

**3.19 Over the past 28 days, how many <u>times</u> have you exercised in a "driven" or "compulsive" way as a means of controlling your weight or shape, or to burn off calories?** .....

## SECTION 4 - Feelings about Muscularity

For the following questions, please check the numbered box that most applies to you, with 1 meaning always and 6 meaning never.

| | Always | Very Often | Often | Sometimes | Rarely | Never |
|---|---|---|---|---|---|---|
| **4.1 I wish that I were more muscular.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.2 I lift weights to build up muscle.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.3 I use protein or energy supplements.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.4 I drink weight gain or protein shakes.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.5 I try to consume as many calories as I can in a day.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.6 I feel guilty if I miss a weight training session** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.7 I think I would feel more confident if I had more muscle mass.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.8 Other people think I work out with weights too often.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.9 I think that I would look better if I gained 10 pounds in weight.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.10 I think about taking anabolic steroids.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.11 I think that I would feel stronger if I gained a little more muscle mass.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.12 I think that my weight training schedule interferes with other aspects of my life.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.13 I think that my arms are not muscular enough.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.14 I think that my chest is not muscular enough.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |
| **4.15 I think that my legs are not muscular enough.** | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |

## SECTION 5 - Quality Of Life

The following questions apply to the past 2 weeks (14 days) only. Please tick the box that most applies to you.

| | Not at all | A little | A moderate amount | Very much | Extremely |
|---|---|---|---|---|---|
| **5.1 How much do you enjoy life?** | | | | | |
| **5.2 To what extent do you feel your life to be meaningful?** | | | | | |
| **5.3 How well are you able to concentrate?** | | | | | |

| | Not at all | A little | Moderately | Mostly | Completely |
|---|---|---|---|---|---|
| **5.4 Are you able to accept your bodily appearance?** | | | | | |

| | Very dissatisfied | Dissatisfied | Neither satisfied or dissatisfied | Satisfied | Very satisfied |
|---|---|---|---|---|---|
| **5.5 How satisfied are you with yourself? (134)** | | | | | |
| **5.6 How satisfied are you with your personal relationships?** | | | | | |
| **5.7 How satisfied are you with your love life?** | | | | | |
| **5.8 How satisfied are you with the support you get from your friends?** | | | | | |

| | Never | Seldom | Quite often | Very often | Always |
|---|---|---|---|---|---|
| **5.9 How often do you have negative feelings such as blue mood, despair, anxiety, depression?** | | | | | |

## SECTION 6 - Attitudes towards Exercise

---

**6.1 How important is it to your general well-being not to miss your exercise sessions?**

0____1____2____3____4____5____6____7____8____9
10

not important very important

**6.2 Does it upset you if, for one reason or another, you are unable to exercise?**

0____1____2____3____4____5____6____7____8____9
10

never upset always upset

**6.3 If you miss an exercise session or sessions, do you put in more time later to make it up?**

0____1____2____3____4____5____6____7____8____9
10

never always

**6.4 Do you continue to exercise when you feel tired or unwell?**

0____1____2____3____4____5____6____7____8____9
10

never always

**6.5 Do you continue to exercise if you have sustained an exercise-related injury?**

0____1____2____3____4____5____6____7____8____9
10

never always

**6.6 Are there times when you turn down an invitation to an interesting social event because it would interfere with your exercise routine?**

0____1____2____3____4____5____6____7____8____9
10

never always

**6.7 Do you have a set routine for your exercise sessions, such as exercising at the same time of day, doing specific exercises, or doing a specific number of exercises?**

0____1____2____3____4____5____6____7____8____9
10

no routine strict routine

**6.8 Do you feel "guilty" that you have "let yourself down" if you miss an exercise session?**

0____1____2____3____4____5____6____7____8____9
10

not at all a great deal

## 6.3 Appendix C - Participant Information Sheet


**Participant Information Sheet**

**Utas Sports Supplement Use: Appearance vs. Performance Motivations Study**

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**1. Invitation**

You are invited to participate in a study being conducted by the University of Tasmania, by researchers Marni Ansell, Daniel Zuj and Dr Jon Mond.

**2. What is the purpose of this study?**

The purpose of this study is to examine prevalence and motivations for sports supplement usage.

**3. Why have I been invited to participate?**

You have been invited to participate in this study because you:

-Are aged between 18 years to 40 years old

-Are currently living in Tasmania

Your involvement in this study is voluntary. While we hope that you will be willing to participate, we respect your right to decline or withdraw at any time.

**4. What will I be asked to do?**

To complete a 15-minute online survey asking about your usage of sports/ dietary supplements and some questions about health and wellbeing. **The survey is anonymous, that is, no identifying information will be obtained from survey participants.**

**5. Are there any possible benefits from participation in this study?**

Your participation in this study will help us to understand how Tasmanians are using sports supplements, and will contribute to our understanding of the prevalence and motivations behind sports supplement use.

**6. Are there any possible risks from participation in this study?**

There are no anticipated risks associated with participation in this study. However, some participants may experience mild discomfort in answering some questions.

**7. Is there any reimbursement for participation?**

Yes! In appreciation of your time, all survey respondents will **enter the draw to win one of four $50 Coles-Myer vouchers**. First year psychology students at the University of Tasmania will receive **15 minutes of course credit.**

**8. What if I change my mind during or after the study?**

Your participation in this study is greatly appreciated, however it is voluntary. You can choose to discontinue participation in the study at any time without providing an explanation. However, once you complete the survey, your data will not be able to be withdrawn as it will not be able to be identified as belonging to you.

**9. What will happen to the information you provide when this study is over?**

All data will be stored on a password protected computer at the University of Tasmania and will be destroyed five [5] years after the date of publication.

**10. How will the results of the study be published?**

We hope to have this research published in a local media outlet, and a peer reviewed scientific journal in due course. No identifiable information about you will be published, your answers will still remain anonymous.

**11. Who do I contact if I have any other queries?**

If you would like to discuss any aspect of this study please contact Miss Marni Ansell (mlansell@utas.edu.au) or Mr Daniel Zuj (daniel.zuj@utas.edu.au).

**12. Who should I contact if I have any concerns?**

This study has been approved by the Tasmanian Health and Medical Human Research Ethics Committee. If you have any concerns about the conduct of this study, please contact the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au, quoting Ethics Reference Number H0016483

Thank you for taking the time to consider this study

**Your consent to participate in this study is implied in your completion of this survey**